Uncovering patterns: Examination of suicide risk among Kentucky veterans

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In 2019, Kentucky's veteran suicide rates (32.8 per 100,000) surpassed state and national rates for nonveterans. Suicide stands as the leading cause of violent death among veterans, particularly among older and

rural-dwelling veterans.

Researchers with the Kentucky Injury Prevention and Research Center (KIPRC), housed in the University of Kentucky College of Public Health, realized that, while there was substantial research examining the individual factors of suicide, there were gaps in understanding how combinations of these factors interact and are associated with suicide—particularly with rural veterans.

The researchers identified distinctive characteristics among male veterans who died by suicide such as being white, older, married, educated beyond high school, used a firearm, left a note, lived in a rural area and had physical health problems compared to nonveterans.

The researchers also found that for older veterans in rural areas, in the presence of one or more of the following factors: alcohol found at the scene, recent death/suicide of a friend or family member, traumatic anniversary, blood alcohol content ≥.08, or a positive drug test, act as disinhibiting factors, making the risk of suicide higher.

By looking at combinations of risk factors, the researchers were able to see which were linked to veteran suicides. This knowledge could be used to prevent suicides in this population.

The data set

Under the Kentucky Violent Death Reporting System (KYVDRS), KIPRC was one of the first states to be funded as part of the National Violent Death Reporting System and has been collecting data since 2005 on veteran suicides. KYVDRS tracks trends and patterns and identifies vulnerable populations. Of notable concern are combat veterans with not only the outcome of suicide but also with suicidal ideation and behaviors.

"We've done [observational studies](link), but we wanted to look at it in a different way, to look at specific instigating, impelling and inhibiting factors—so the combination of these factors—to find out what activities would work best for the veterans," shared Sabrina Brown, DrPH, associate professor in the Department of Epidemiology and a researcher at KIPRC in the College of Public Health.

To bridge this research gap, Brown and her colleagues used the I3 model, which predicts rare or catastrophic behaviors, as a framework. Perfect Storm Theory (PST), an extension of the I3 model, proposes that human behavior results from the intensity of three interacting processes: instigation, impellance and (dis)inhibition.

In other words, certain behaviors are most likely to occur when instigation and impellance, defined by the National Institutes of Health as "situational or dispositional qualities (e.g., trait aggressiveness) that influence how strongly the instigator produces a proclivity to enact that response," are high and inhibition is weak.

The researchers used the PST to examine KYVDRS data on suicides that occurred between 2010 and 2019 to explore how various factors interact and contribute to the risk of veterans dying by suicide, focusing on the influence of living in rural areas. They aimed to differentiate the suicide risk between veterans and non-veterans while understanding and predicting suicidal behaviors. By combining the two models, I3 and PST, the researchers sought to understand the complicated factors influencing veterans' susceptibility to suicide.

The data collected encompassed a total of 6,762 individuals aged 18 and above. While veterans made up 7.8% of the adult population in the state for the study's time period, their representation among suicide deaths was disproportionately high at over 13%. With an average age of 48, the majority from this sample were male (80.61%) and white (96.85%).

Firearms were the primary method of self-harm (62.64%), and over half lived in metropolitan areas (56.52%). Integrated into NVDRS, KYVDRS provides a detailed dataset with more than 600 unique elements, offering insights into factors leading to suicides, including life stressors, mental and physical health issues, relationships, and recent crises.

The feasible solution algorithm: Novel approach

To dig deeper into these factors and their interactions, researchers Arnold J. Stromberg, Ph.D., former chair of the UK Dr. Bing Zhang Department of Statistics, and Katherine L. Thompson, Ph.D., associate professor of statistics, developed a statistical modeling technique known as the Feasible Solution Algorithm (FSA).

This algorithm was specifically designed to explore how various factors work together and influence suicide risk, especially considering factors such as age, gender, and whether the event was reactive or premeditated.

The FSA helps identify which variables become significant when considered in combination, making it particularly useful for testing theories like PST, which involves three-way interactions. It provided a single solution each time it ran, helping identify important interactions, especially those related to the three-way interaction in the PST. They ran the FSA multiple times to discover various potential solutions, ensuring they didn't miss any important patterns in the data.

The findings showed that male veterans in Kentucky, especially those who were white, older, married and living in rural areas, faced higher suicide risks.

Rural veterans, with greater access to firearms, were particularly at risk. Surprisingly, veterans were less likely to have issues with alcohol, substance use, intimate partners, jobs, or finances when compared to

nonveterans.

FSA was used to explore interactions between age, rural living and disinhibiting factors. Among other things, the researchers found that the combination of these three characteristics was predictive of suicide in older rural veterans.

"The findings from this study provide invaluable insights that extend beyond traditional approaches to veteran support," said Brown. "Not only will they inform the [U.S. Department of] Veterans Affairs and other health care providers in tailoring their prevention and intervention efforts, but they will also benefit nonprofit organizations and community groups working with veteran families. Organizations can use this information to advocate for funding and resources, highlighting the importance of stabilizing home life to improve overall well-being."

To address suicide risks among veterans in Kentucky, targeted interventions based on the study's results are recommended. These include increasing awareness of underlying risk factors, implementing proven clinical interventions to significantly reduce alcohol and drug misuse among older rural veterans, integrating mental health and suicide screening, offering firearms safety counseling in primary care, and improving opportunities for rural veterans to connect with behavioral health specialists.

"Understanding the specific psychosocial challenges faced by rural veterans, particularly among the older generation of veterans, is crucial for addressing suicidogenic factors effectively," said Brown. "This research offers a pathway toward more targeted and impactful support for veterans and their families."

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